

Print: Last Name

First Name

Calculus and analytic geometry 2413, Oct 28, 2010,

Test #2

Show ALL supporting work. Box final answers. Use up white pages first. Follow the mathematical writing rules.

Only basic calculators are allowed. Only one solid hand-written notebook is allowed.

Each part of Problem 1 is 5 points. Problems 2-7 are 10 points each.

Differentiate the following functions, simplify, and perform the required tasks.

a) $f(x) = \frac{x^2 + 9x + 14}{x^2 - 16}$, find $f'(x)$ and simplify.

b) $f(x) = x^4 e^x$, find roots of $f'(x) = 0$.

c) $f(x) = \csc(x) + e^x \cot(x)$, find $f'(x)$.

d) $f(x) = \frac{1 + \sin x}{x + \cos x}$, find roots of $f'(x) = 0$.

e) $f(x) = \cos^5(x^3 + x^2)$, find $f'(x)$.

f) $f(x) = (2x + 3)^5(4x + 5)^7$, find roots of $f'(x) = 0$.

g) $x^4y^2 + 8x^3y^3 + x^2y^4 = 10$, find y' using implicit differentiation, also find equation of tangent line at $(1, 1)$.

h) Use Logarithmic differentiation to find $f'(x)$ if $f(x) = \sin(x)^{\cos(x)}$

2) Find and simplify (using factorial notation) $f^{(100)}(x)$ and $f^{(101)}(x)$ if $f(x) = \frac{5}{x^7}$.

3) At noon, ship A is 200 km west of ship B . Ship A is sailing north at 40 km/h and ship B is ALSO sailing north at 70 km/h. How fast is the distance between ships changing at 6:00 P.M.?

4) Use differentials or linear approximation to estimate $\sqrt[3]{999.1}$. Show all steps.

5a) What is the differential of $y = x^3 + x^2$.

5b) Evaluate dy for $x = 1$ and $dx = 0.1$.

5c) Evaluate Δy for $x = 1$ and $dx = 0.1$.

6) Find the absolute maximum and minimum of $f(x) = x^3 + x^2 - x + 1$ on $[-2, 1]$.

7) Verify that the function satisfies the hypothesis of the Mean Value Theorem on the given interval. (List the conditions.) Find all numbers c that satisfy the conclusion of the MVT.

$$f(x) = \frac{x-1}{2x+3}, [-1, 3].$$